



## SEQUENCE LISTING

<110> DIVERSA CORPORATION  
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MATHUR, Eric J.

<120> ENZYMES HAVING TRANSAMINASE AND AMINOTRANSFERASE ACTIVITY AND  
METHODS OF USE THEREOF

<130> DIVER1240-7

<140> US 09/905,173

<141> 2001-07-12

<150> US 09/412,184

<151> 1999-10-04

<150> US 09/389,537

<151> 1999-09-02

<150> US 08/646,590

<151> 1996-05-08

<150> US 08/599,171

<151> 1996-02-09

<150> US 09/481,733

<151> 2000-01-11

<150> US 09/069,226

<151> 1998-04-27

<160> 40

<170> PatentIn version 3.0

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 Cont

260	265	270
Ala His Leu Lys Ser Tyr Leu Asp Tyr Gly Ile Phe Thr Pro Ile Gln 275	280	285
Val Ala Ser Ile Ile Ala Leu Glu Ser Pro Tyr Glu Ile Val Glu Lys 290	295	300
Thr Ala Lys Val Tyr Gln Lys Arg Arg Asp Val Leu Val Glu Gly Leu 305	310	315
Asn Arg Leu Gly Trp Lys Val Lys Lys Pro Lys Ala Thr Met Phe Val 325	330	335
Trp Ala Lys Ile Pro Glu Trp Ile Asn Met Asn Ser Leu Asp Phe Ser 340	345	350
Leu Phe Leu Leu Lys Glu Ala Lys Val Ala Val Ser Pro Gly Val Gly 355	360	365
Phe Gly Gln Tyr Gly Glu Gly Tyr Val Arg Phe Ala Leu Val Glu Asn 370	375	380
Glu His Arg Ile Arg Gln Ala Ile Arg Gly Ile Arg Lys Ala Phe Arg 385	390	395
Lys Leu Gln Lys Glu Arg Lys Leu Glu Pro Glu Arg Ser Ala 405	410	

<210> 26  
 <211> 373  
 <212> PRT  
 <213> Aquifex

<400> 26

Met Asp Arg Leu Glu Lys Val Ser Pro Phe Ile Val Met Asp Ile Leu  
1 5 10 15

Ala Gln Ala Gln Lys Tyr Glu Asp Val Val His Met Glu Ile Gly Glu  
20 25 30

Pro Asp Leu Glu Pro Ser Pro Lys Val Met Glu Ala Leu Glu Arg Ala  
35 40 45

Val Lys Glu Lys Thr Phe Phe Tyr Thr Pro Ala Leu Gly Leu Trp Glu  
50 55 60

Leu Arg Glu Arg Ile Ser Glu Phe Tyr Arg Lys Lys Tyr Ser Val Glu  
65 70 75 80

Val Ser Pro Glu Arg Val Ile Val Thr Thr Gly Thr Ser Gly Ala Phe  
85 90 95

Leu Val Ala Tyr Ala Val Thr Leu Asn Ala Gly Glu Lys Ile Ile Leu  
100 105 110

Pro Asp Pro Ser Tyr Pro Cys Tyr Lys Asn Phe Ala Tyr Leu Leu Asp  
115 120 125

Ala Gln Pro Val Phe Val Asn Val Asp Lys Glu Thr Asn Tyr Glu Val

al  
Cont

130

135

140

Arg Lys Glu Met Ile Glu Asp Ile Asp Ala Lys Ala Leu His Ile Ser  
145 150 155 160

Ser Pro Gln Asn Pro Thr Gly Thr Leu Tyr Ser Pro Glu Thr Leu Lys  
165 170 175

Glu Leu Ala Glu Tyr Cys Glu Glu Lys Gly Met Tyr Phe Ile Ser Asp  
180 185 190

Glu Ile Tyr His Gly Leu Val Tyr Glu Gly Arg Glu His Thr Ala Leu  
195 200 205

Glu Phe Ser Asp Arg Ala Ile Val Ile Asn Gly Phe Ser Lys Tyr Phe  
210 215 220

Cys Met Pro Gly Phe Arg Ile Gly Trp Met Ile Val Pro Glu Glu Leu  
225 230 235 240

Val Arg Lys Ala Glu Ile Val Ile Gln Asn Val Phe Ile Ser Ala Pro  
245 250 255

Thr Leu Ser Gln Tyr Ala Ala Leu Glu Ala Phe Asp Tyr Glu Tyr Leu  
260 265 270

Glu Lys Val Arg Lys Thr Phe Glu Glu Arg Arg Asn Phe Leu Tyr Gly  
275 280 285

Glu Leu Lys Lys Leu Phe Lys Ile Asp Ala Lys Pro Gln Gly Ala Phe  
290 295 300

Tyr Val Trp Ala Asn Ile Ser Asp Tyr Ser Thr Asp Ser Tyr Glu Phe  
305 310 315 320

Ala Leu Lys Leu Leu Arg Glu Ala Arg Val Ala Val Thr Pro Gly Val  
325 330 335

Asp Phe Gly Lys Asn Lys Thr Lys Glu Tyr Ile Arg Phe Ala Tyr Thr  
340 345 350

Arg Lys Ile Glu Glu Leu Lys Glu Gly Val Glu Arg Ile Lys Lys Phe  
355 360 365

Leu Glu Lys Leu Ser  
370

<210> 27  
<211> 453  
<212> PRT  
<213> Aquifex

<400> 27

Met Trp Glu Leu Asp Pro Lys Thr Leu Glu Lys Trp Asp Lys Glu Tyr  
1 5 10 15

Phe Trp His Pro Phe Thr Gln Met Lys Val Tyr Arg Glu Glu Glu Asn  
20 25 30

Leu Ile Phe Glu Arg Gly Glu Gly Val Tyr Leu Trp Asp Ile Tyr Gly

a!  
Cont

35	40	45
Arg Lys Tyr Ile Asp Ala Ile Ser Ser Leu Trp Cys Asn Val His Gly 50 55 60		
His Asn His Pro Lys Leu Asn Asn Ala Val Met Lys Gln Leu Cys Lys 65 70 75 80		
Val Ala His Thr Thr Thr Leu Gly Ser Ser Asn Val Pro Ala Ile Leu 85 90 95		
Leu Ala Lys Lys Leu Val Glu Ile Ser Pro Glu Gly Leu Asn Lys Val 100 105 110		
Phe Tyr Ser Glu Asp Gly Ala Glu Ala Val Glu Ile Ala Ile Lys Met 115 120 125		
Ala Tyr His Tyr Trp Lys Asn Lys Gly Val Lys Gly Lys Asn Val Phe 130 135 140		
Ile Thr Leu Ser Glu Ala Tyr His Gly Asp Thr Val Gly Ala Val Ser 145 150 155 160		
Val Gly Gly Ile Glu Leu Phe His Gly Thr Tyr Lys Asp Leu Leu Phe 165 170 175		
Lys Thr Ile Lys Leu Pro Ser Pro Tyr Leu Tyr Cys Lys Glu Lys Tyr 180 185 190		
Gly Glu Leu Cys Pro Glu Cys Thr Ala Asp Leu Leu Lys Gln Leu Glu 195 200 205		
Asp Ile Leu Lys Ser Arg Glu Asp Ile Val Ala Val Ile Met Glu Ala 210 215 220		
Gly Ile Gln Ala Ala Ala Gly Met Leu Pro Phe Pro Pro Gly Phe Leu 225 230 235 240		
Lys Gly Val Arg Glu Leu Thr Lys Lys Tyr Asp Thr Leu Met Ile Val 245 250 255		
Asp Glu Val Ala Thr Gly Phe Gly Arg Thr Gly Thr Met Phe Tyr Cys 260 265 270		
Glu Gln Glu Gly Val Ser Pro Asp Phe Met Cys Leu Gly Lys Gly Ile 275 280 285		
Thr Gly Gly Tyr Leu Pro Leu Ala Ala Thr Leu Thr Thr Asp Glu Val 290 295 300		
Phe Asn Ala Phe Leu Gly Glu Phe Gly Glu Ala Lys His Phe Tyr His 305 310 315 320		
Gly His Thr Tyr Thr Gly Asn Asn Leu Ala Cys Ser Val Ala Leu Ala 325 330 335		
Asn Leu Glu Val Phe Glu Glu Glu Arg Thr Leu Glu Lys Leu Gln Pro 340 345 350		
Lys Ile Lys Leu Leu Lys Glu Arg Leu Gln Glu Phe Trp Glu Leu Lys 355 360 365		

Q1  
Cont

His Val Gly Asp Val Arg Gln Leu Gly Phe Met Ala Gly Ile Glu Leu  
370 375 380

Val Lys Asp Lys Glu Lys Gly Glu Pro Phe Pro Tyr Gly Glu Arg Thr  
385 390 395 400

Gly Phe Lys Val Ala Tyr Lys Cys Arg Glu Lys Gly Val Phe Leu Arg  
405 410 415

Pro Leu Gly Asp Val Met Val Leu Met Met Pro Leu Val Ile Glu Glu  
420 425 430

Asp Glu Met Asn Tyr Val Ile Asp Thr Leu Lys Trp Ala Ile Lys Glu  
435 440 445

Leu Glu Lys Glu Val  
450

<210> 28  
<211> 343  
<212> PRT  
<213> Aquifex

<400> 28

Met Thr Tyr Leu Met Asn Asn Tyr Ala Arg Leu Pro Val Lys Phe Val  
1 5 10 15

Arg Gly Lys Gly Val Tyr Leu Tyr Asp Glu Glu Gly Lys Glu Tyr Leu  
20 25 30

Asp Phe Val Ser Gly Ile Gly Val Asn Ser Leu Gly His Ala Tyr Pro  
35 40 45

Lys Leu Thr Glu Ala Leu Lys Glu Gln Val Glu Lys Leu Leu His Val  
50 55 60

Ser Asn Leu Tyr Glu Asn Pro Trp Gln Glu Glu Leu Ala His Lys Leu  
65 70 75 80

Val Lys His Phe Trp Thr Glu Gly Lys Val Phe Phe Ala Asn Ser Gly  
85 90 95

Thr Glu Ser Val Glu Ala Ala Ile Lys Leu Ala Arg Lys Tyr Trp Arg  
100 105 110

Asp Lys Gly Lys Asn Lys Trp Lys Phe Ile Ser Phe Glu Asn Ser Phe  
115 120 125

His Gly Arg Thr Tyr Gly Ser Leu Ser Ala Thr Gly Gln Pro Lys Phe  
130 135 140

His Lys Gly Phe Glu Pro Leu Val Pro Gly Phe Ser Tyr Ala Lys Leu  
145 150 155 160

Asn Asp Ile Asp Ser Val Tyr Lys Leu Leu Asp Glu Glu Thr Ala Gly  
165 170 175

Ile Ile Ile Glu Val Ile Gln Gly Glu Gly Gly Val Asn Glu Ala Ser  
180 185 190

*a' Cord*

Glu Asp Phe Leu Ser Lys Leu Gln Glu Ile Cys Lys Glu Lys Asp Val  
195 200 205

Leu Leu Ile Ile Asp Glu Val Gln Thr Gly Ile Gly Arg Thr Gly Glu  
210 215 220

Phe Tyr Ala Tyr Gln His Phe Asn Leu Lys Pro Asp Val Ile Ala Leu  
225 230 235 240

Ala Lys Gly Leu Gly Gly Gly Val Pro Ile Gly Ala Ile Leu Ala Arg  
245 250 255

Glu Glu Val Ala Gln Ser Phe Thr Pro Gly Ser His Gly Ser Thr Phe  
260 265 270

Gly Gly Asn Pro Leu Ala Cys Arg Ala Gly Thr Val Val Val Asp Glu  
275 280 285

Val Glu Lys Leu Leu Pro His Val Arg Glu Val Gly Asn Tyr Phe Lys  
290 295 300

Glu Lys Leu Lys Glu Leu Gly Lys Gly Lys Val Lys Gly Arg Gly Leu  
305 310 315 320

Met Leu Gly Leu Glu Leu Glu Arg Glu Cys Lys Asp Tyr Val Leu Lys  
325 330 335

Ala Leu Glu Arg Asp Phe Ser  
340

<210> 29

<211> 398

<212> PRT

<213> Ammonifex degensii

<400> 29

Met Arg Lys Leu Ala Glu Arg Ala Gln Lys Leu Ser Pro Ser Pro Thr  
1 5 10 15

Leu Ser Val Asp Thr Lys Ala Lys Glu Leu Leu Arg Gln Gly Glu Arg  
20 25 30

Val Ile Asn Phe Gly Ala Gly Glu Pro Asp Phe Asp Thr Pro Glu His  
35 40 45

Ile Lys Glu Ala Ala Lys Arg Ala Leu Asp Gln Gly Phe Thr Lys Tyr  
50 55 60

Thr Pro Val Ala Gly Ile Leu Pro Leu Arg Glu Ala Ile Cys Glu Lys  
65 70 75 80

Leu Tyr Arg Asp Asn Gln Leu Glu Tyr Ser Pro Asn Glu Ile Val Val  
85 90 95

Ser Cys Gly Ala Lys His Ser Ile Phe Asn Ala Leu Gln Val Leu Leu  
100 105 110

Asp Pro Gly Asp Glu Val Ile Ile Pro Val Pro Tyr Trp Thr Ser Tyr  
115 120 125

a'  
Cont.



Pro Glu Gln Val Lys Leu Ala Gly Gly Val Pro Val Phe Val Pro Thr  
 130 135 140  
 Ser Pro Glu Asn Asp Phe Lys Leu Arg Pro Glu Asp Leu Arg Ala Ala  
 145 150 155 160  
 Val Thr Pro Arg Thr Arg Leu Leu Ile Leu Asn Ser Pro Ala Asn Pro  
 165 170 175  
 Thr Gly Thr Val Tyr Arg Arg Glu Glu Leu Ile Gly Leu Ala Glu Val  
 180 185 190  
 Ala Leu Glu Ala Asp Leu Trp Ile Leu Ser Asp Glu Ile Tyr Glu Lys  
 195 200 205  
 Leu Ile Tyr Asp Gly Met Glu His Val Ser Ile Ala Ala Leu Asp Pro  
 210 215 220  
 Glu Val Lys Lys Arg Thr Ile Val Val Asn Gly Val Ser Lys Ala Tyr  
 225 230 235 240  
 Ala Met Thr Gly Trp Arg Ile Gly Tyr Ala Ala Ala Pro Arg Pro Ile  
 245 250 255  
 Ala Gln Ala Met Thr Asn Leu Gln Ser His Ser Thr Ser Asn Pro Thr  
 260 265 270  
 Ser Val Ala Gln Ala Ala Ala Leu Ala Ala Leu Lys Gly Pro Gln Glu  
 275 280 285  
 Pro Val Glu Asn Met Arg Arg Ala Phe Gln Lys Arg Arg Asp Phe Ile  
 290 295 300  
 Trp Gln Tyr Leu Asn Ser Leu Pro Gly Val Arg Cys Pro Lys Pro Leu  
 305 310 315 320  
 Gly Ala Phe Tyr Val Phe Pro Glu Val Glu Arg Ala Phe Gly Pro Pro  
 325 330 335  
 Ser Lys Arg Thr Gly Asn Thr Thr Ala Ser Asp Leu Ala Leu Phe Leu  
 340 345 350  
 Leu Glu Glu Ile Lys Val Ala Thr Val Ala Gly Ala Ala Phe Gly Asp  
 355 360 365  
 Asp Arg Tyr Leu Arg Phe Ser Tyr Ala Leu Arg Leu Glu Asp Ile Glu  
 370 375 380  
 Glu Gly Met Gln Arg Phe Lys Glu Leu Ile Glu Ala Ala Leu  
 385 390 395

<210> 30  
 <211> 592  
 <212> PRT  
 <213> Aquifex

<400> 30

Met Cys Gly Ile Val Gly Tyr Val Gly Arg Asp Leu Ala Leu Pro Ile  
 1 5 10 15

1  
 Cont.

Val Leu Gly Ala Leu Glu Arg Leu Glu Tyr Arg Gly Tyr Asp Ser Ala  
 20 25 30  
 Gly Val Ala Leu Ile Glu Asp Gly Lys Leu Ile Val Glu Lys Lys Lys  
 35 40 45  
 Gly Lys Ile Arg Glu Leu Val Lys Ala Leu Trp Gly Lys Asp Tyr Lys  
 50 55 60  
 Ala Lys Thr Gly Ile Gly His Thr Arg Trp Ala Thr His Gly Lys Pro  
 65 70 75 80  
 Thr Asp Glu Asn Ala His Pro His Thr Asp Glu Lys Gly Glu Phe Ala  
 85 90 95  
 Val Val His Asn Gly Ile Ile Glu Asn Tyr Leu Glu Leu Lys Glu Glu  
 100 105 110  
 Leu Lys Lys Glu Gly Val Lys Phe Arg Ser Glu Thr Asp Thr Glu Val  
 115 120 125  
 Ile Ala His Leu Ile Ala Lys Asn Tyr Arg Gly Asp Leu Leu Glu Ala  
 130 135 140  
 Val Leu Lys Thr Val Lys Lys Leu Lys Gly Ala Phe Ala Phe Ala Val  
 145 150 155 160  
 Ile Thr Val His Glu Pro Asn Arg Leu Ile Gly Val Lys Gln Gly Ser  
 165 170 175  
 Pro Leu Ile Val Gly Leu Gly Glu Gly Glu Asn Phe Leu Ala Ser Asp  
 180 185 190  
 Ile Pro Ala Ile Leu Pro Tyr Thr Lys Lys Ile Ile Val Leu Asp Asp  
 195 200 205  
 Gly Glu Ile Ala Asp Leu Thr Pro Asp Thr Val Asn Ile Tyr Asn Phe  
 210 215 220  
 Glu Gly Glu Pro Val Ser Lys Glu Val Met Ile Thr Pro Trp Asp Leu  
 225 230 235 240  
 Val Ser Ala Glu Lys Gly Gly Phe Lys His Phe Met Leu Lys Glu Ile  
 245 250 255  
 Tyr Glu Gln Pro Lys Ala Ile Asn Asp Thr Leu Lys Gly Phe Leu Ser  
 260 265 270  
 Thr Glu Asp Ala Ile Pro Phe Lys Leu Lys Asp Phe Arg Arg Val Leu  
 275 280 285  
 Ile Ile Ala Cys Gly Thr Ser Tyr His Ala Gly Phe Val Gly Lys Tyr  
 290 295 300  
 Trp Ile Glu Arg Phe Ala Gly Val Pro Thr Glu Val Ile Tyr Ala Ser  
 305 310 315 320  
 Glu Phe Arg Tyr Ala Asp Val Pro Val Ser Asp Lys Asp Ile Val Ile  
 325 330 335

a  
 Cont

Gly Ile Ser Gln Ser Gly Glu Thr Ala Asp Thr Lys Phe Ala Leu Gln  
 340 345 350  
 Ser Ala Lys Glu Lys Gly Ala Phe Thr Val Gly Leu Val Asn Val Val  
 355 360 365  
 Gly Ser Ala Ile Asp Arg Glu Ser Asp Phe Ser Leu His Thr His Ala  
 370 375 380  
 Gly Pro Glu Ile Gly Val Ala Ala Thr Lys Thr Phe Thr Ala Gln Phe  
 385 390 395 400  
 Thr Ala Leu Tyr Ala Leu Ser Val Arg Glu Ser Glu Glu Arg Glu Asn  
 405 410 415  
 Leu Ile Arg Leu Leu Glu Lys Val Pro Ser Leu Val Glu Gln Thr Leu  
 420 425 430  
 Asn Thr Ala Glu Glu Val Glu Lys Val Ala Glu Lys Tyr Met Lys Lys  
 435 440 445  
 Lys Asn Met Leu Tyr Leu Gly Arg Tyr Leu Asn Tyr Pro Ile Ala Leu  
 450 455 460  
 Glu Gly Ala Leu Lys Leu Lys Glu Ile Ser Tyr Ile His Ala Glu Gly  
 465 470 475 480  
 Tyr Pro Ala Gly Glu Met Lys His Gly Pro Ile Ala Leu Ile Asp Glu  
 485 490 495  
 Asn Met Pro Val Val Val Ile Ala Pro Lys Asp Arg Val Tyr Glu Lys  
 500 505 510  
 Ile Leu Ser Asn Val Glu Glu Val Leu Ala Arg Lys Gly Arg Val Ile  
 515 520 525  
 Ser Val Gly Phe Lys Gly Asp Glu Thr Leu Lys Ser Lys Ser Glu Ser  
 530 535 540  
 Val Met Glu Ile Pro Lys Ala Glu Glu Pro Ile Thr Pro Phe Leu Thr  
 545 550 555 560  
 Val Ile Pro Leu Gln Leu Phe Ala Tyr Phe Ile Ala Ser Lys Leu Gly  
 565 570 575  
 Leu Asp Val Asp Gln Pro Arg Asn Leu Ala Lys Thr Val Thr Val Glu  
 580 585 590  
 <210> 31  
 <211> 354  
 <212> PRT  
 <213> Aquifex  
 <400> 31  
 Met Ile Pro Gln Arg Ile Lys Glu Leu Glu Ala Tyr Lys Thr Glu Val  
 1 5 10 15  
 Thr Pro Ala Ser Val Arg Leu Ser Ser Asn Glu Phe Pro Tyr Asp Phe  
 20 25 30

a!  
 Cont.

Pro Glu Glu Ile Lys Gln Arg Ala Leu Glu Glu Leu Lys Lys Val Pro  
 35 40 45  
 Leu Asn Lys Tyr Pro Asp Pro Glu Ala Lys Glu Leu Lys Ala Val Leu  
 50 55 60  
 Ala Asp Phe Phe Gly Val Lys Glu Glu Asn Leu Val Leu Gly Asn Gly  
 65 70 75 80  
 Ser Asp Glu Leu Ile Tyr Tyr Leu Ser Ile Ala Ile Gly Glu Leu Tyr  
 85 90 95  
 Ile Pro Val Tyr Ile Pro Val Pro Thr Phe Pro Met Tyr Glu Ile Ser  
 100 105 110  
 Ala Lys Val Leu Gly Arg Pro Leu Val Lys Val Gln Leu Asp Glu Asn  
 115 120 125  
 Phe Asp Ile Asp Leu Glu Arg Ser Ile Glu Leu Ile Glu Lys Glu Lys  
 130 135 140  
 Pro Val Leu Gly Tyr Phe Ala Tyr Pro Asn Asn Pro Thr Gly Asn Leu  
 145 150 155 160  
 Phe Ser Arg Gly Lys Ile Glu Glu Ile Arg Asn Arg Gly Val Phe Cys  
 165 170 175  
 Val Ile Asp Glu Ala Tyr Tyr His Tyr Ser Gly Glu Thr Phe Leu Glu  
 180 185 190  
 Asp Ala Leu Lys Arg Glu Asp Thr Val Val Leu Arg Thr Leu Ser Lys  
 195 200 205  
 Ile Gly Met Ala Ser Leu Arg Val Gly Ile Leu Ile Gly Lys Gly Glu  
 210 215 220  
 Ile Val Ser Glu Ile Asn Lys Val Arg Leu Pro Phe Asn Val Thr Tyr  
 225 230 235 240  
 Pro Ser Gln Val Met Ala Lys Val Leu Leu Thr Glu Gly Arg Glu Phe  
 245 250 255  
 Leu Met Glu Lys Ile Gln Glu Val Val Thr Glu Arg Glu Arg Met Tyr  
 260 265 270  
 Asp Glu Met Lys Lys Ile Glu Gly Val Glu Val Phe Pro Ser Lys Ala  
 275 280 285  
 Asn Phe Leu Leu Phe Arg Thr Pro Tyr Pro Ala His Glu Val Tyr Gln  
 290 295 300  
 Glu Leu Leu Lys Arg Asp Val Leu Val Arg Asn Val Ser Tyr Met Glu  
 305 310 315 320  
 Gly Leu Gln Lys Cys Leu Arg Val Ser Val Gly Lys Pro Glu Glu Asn  
 325 330 335  
 Asn Lys Phe Leu Glu Ala Leu Glu Glu Ser Ile Lys Ser Leu Ser Ser  
 340 345 350  
 Ser Leu

a!  
 Cont.

<210> 32  
 <211> 303  
 <212> PRT  
 <213> Pyrobaculum aerophilum

<400> 32

Met Lys Pro Tyr Ala Lys Tyr Ile Trp Leu Asp Gly Arg Ile Leu Lys  
 1 5 10 15

Trp Glu Asp Ala Lys Ile His Val Leu Thr His Ala Leu His Tyr Gly  
 20 25 30

Thr Ser Ile Phe Glu Gly Ile Arg Gly Tyr Trp Asn Gly Asp Asn Leu  
 35 40 45

Leu Val Phe Arg Leu Glu Glu His Ile Asp Arg Met Tyr Arg Ser Ala  
 50 55 60

Lys Ile Leu Gly Ile Asn Ile Pro Tyr Thr Arg Glu Glu Val Arg Gln  
 65 70 75 80

Ala Val Leu Glu Thr Ile Lys Ala Asn Asn Phe Arg Glu Asp Val Tyr  
 85 90 95

Ile Arg Pro Val Ala Phe Val Ala Ser Gln Thr Val Thr Leu Asp Ile  
 100 105 110

Arg Asn Leu Glu Val Ser Leu Ala Val Ile Val Phe Pro Phe Gly Lys  
 115 120 125

Tyr Leu Ser Pro Asn Gly Ile Lys Ala Thr Ile Val Ser Trp Arg Arg  
 130 135 140

Val His Asn Thr Met Leu Pro Val Met Ala Lys Ile Gly Gly Ile Tyr  
 145 150 155 160

Val Asn Ser Val Leu Ala Leu Val Glu Ala Arg Ser Arg Gly Phe Asp  
 165 170 175

Glu Ala Leu Leu Met Asp Val Asn Gly Tyr Val Val Glu Gly Ser Gly  
 180 185 190

Glu Asn Ile Phe Ile Val Arg Gly Gly Arg Leu Phe Thr Pro Pro Val  
 195 200 205

His Glu Ser Ile Leu Glu Gly Ile Thr Arg Asp Thr Val Ile Lys Leu  
 210 215 220

Ser Gly Asp Val Gly Leu Arg Val Glu Glu Lys Pro Ile Thr Arg Glu  
 225 230 235 240

Glu Val Tyr Thr Ala Asp Glu Val Phe Leu Val Gly Thr Ala Ala Glu  
 245 250 255

Ile Thr Pro Val Val Glu Val Asp Gly Arg Thr Ile Gly Thr Gly Lys  
 260 265 270

Pro Gly Pro Ile Thr Thr Lys Ile Ala Glu Leu Tyr Ser Asn Val Val

a'  
 Cont

275 280 285  
 Arg Gly Lys Val Glu Lys Tyr Leu Asn Trp Ile Thr Pro Val Tyr  
 290 295 300

<210> 33  
 <211> 52  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Primer for PCR

<400> 33  
 ccgagaattc attaaagagg agaaattaac tatggcagtc aaagtgcggc ct 52

<210> 34  
 <211> 31  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Primer for PCR

<400> 34  
 gaaggacctt cgaaacctat tcctaggagg c 31

<210> 35  
 <211> 1092  
 <212> DNA  
 <213> Ammonifex degensii

<220>  
 <221> misc\_feature

<222> (986)..(987)  
 <223> n is any nucleotide

a' Cont  
 <400> 35  
 atggcagtc aagtgcggcc tgagctcagc caggtggaga tctaccgtcc cggcaaacc 60  
 atcgaagagg taaagaagga gctggggctg gaggaggtag tcaagctggc ctccaacgag 120  
 aaccctctgg gaccttctcc caaggccgtg gcggcgctgg agggactgga cactggcac 180  
 ctttaccag aaggctcaag ctatgagcta cggcaggcgc tgggtaagaa actggagata 240  
 gaccgggaca gcatcatcgt gggttgcggc tcaagcgaag tcatccagat gctctctttg 300  
 gccctgctgg cgcccggcga cgaggtggtc atccctgtgc ctacctttcc ccgctatgag 360  
 ccctggcac ggctcatggg ggctaattccc gtaaaagttc ccttgaagga ctaccgcac 420  
 gatgtggagg cagtggccc agccctttcc ccccgtagca agctgggtcta cctatgcaac 480  
 cccaacaacc ccaccgggac catcgtcacc cgggaggagg tggagtgggt cttggaaaag 540  
 gcgggggagg gggttctcac cgtgctggac gaggcctact gcgagtacgt gaccagcccc 600

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gcctaccctg atgggctcga tttcctgcgc cggggctaca atgtggtggt gctgcgcacc 660
ttctccaaga tctacgggct ggccgggctg cgcatagggt acggtgtggc ggacagggag 720
ctggtggcgg aactgcaccg ggtgcgggag cctttcaatg tcagttccgc tgctcagata 780
gccgccctgg ccgccctgga agacgaagag ttcgtggcgc tttcgcgcca ggtcaacgaa 840
gaaggggaagg tttttctcta ccgagaactg gagaggcggg ggatcgcta cgtgcccacc 900
gaggccaact tcctactctt cgatgccggt cgggacgagc aggaagtatt tcgccggatg 960
ctgcgccagg gagtgatcat ccgggncggg gtgggttatc ccaccactt aagggtgacc 1020
atcggcacct tggaacagaa ccagcgcttc ctggaagctt tggataaggc tctagagctt 1080
aggggggttt aa 1092

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<210> 36
<211> 363
<212> PRT
<213> Ammonifex degensii

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<220>
<221> VARIANT

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<222> (329)..(330)
<223> Xaa is any Amino Acid

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<400> 36

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Met Ala Val Lys Val Arg Pro Glu Leu Ser Gln Val Glu Ile Tyr Arg
1          5          10          15

Pro Gly Lys Pro Ile Glu Glu Val Lys Lys Glu Leu Gly Leu Glu Glu
20        25        30

Val Val Lys Leu Ala Ser Asn Glu Asn Pro Leu Gly Pro Ser Pro Lys
35        40        45

Ala Val Ala Ala Leu Glu Gly Leu Asp His Trp His Leu Tyr Pro Glu
50        55        60

Gly Ser Ser Tyr Glu Leu Arg Gln Ala Leu Gly Lys Lys Leu Glu Ile
65        70        75        80

Asp Pro Asp Ser Ile Ile Val Gly Cys Gly Ser Ser Glu Val Ile Gln
85        90        95

Met Leu Ser Leu Ala Leu Leu Ala Pro Gly Asp Glu Val Val Ile Pro
100       105       110

Val Pro Thr Phe Pro Arg Tyr Glu Pro Leu Ala Arg Leu Met Gly Ala
115       120       125

Asn Pro Val Lys Val Pro Leu Lys Asp Tyr Arg Ile Asp Val Glu Ala
130       135       140

Val Ala Arg Ala Leu Ser Pro Arg Thr Lys Leu Val Tyr Leu Cys Asn
145       150       155       160

```

a1  
cont

Pro Asn Asn Pro Thr Gly Thr Ile Val Thr Arg Glu Glu Val Glu Trp  
 165 170 175

Phe Leu Glu Lys Ala Gly Glu Gly Val Leu Thr Val Leu Asp Glu Ala  
 180 185 190

Tyr Cys Glu Tyr Val Thr Ser Pro Ala Tyr Pro Asp Gly Leu Asp Phe  
 195 200 205

Leu Arg Arg Gly Tyr Asn Val Val Val Leu Arg Thr Phe Ser Lys Ile  
 210 215 220

Tyr Gly Leu Ala Gly Leu Arg Ile Gly Tyr Gly Val Ala Asp Arg Glu  
 225 230 235 240

Leu Val Ala Glu Leu His Arg Val Arg Glu Pro Phe Asn Val Ser Ser  
 245 250 255

Ala Ala Gln Ile Ala Ala Leu Ala Ala Leu Glu Asp Glu Glu Phe Val  
 260 265 270

Ala Leu Ser Arg Gln Val Asn Glu Glu Gly Lys Val Phe Leu Tyr Arg  
 275 280 285

Glu Leu Glu Arg Arg Gly Ile Ala Tyr Val Pro Thr Glu Ala Asn Phe  
 290 295 300

Leu Leu Phe Asp Ala Gly Arg Asp Glu Gln Glu Val Phe Arg Arg Met  
 305 310 315 320

Leu Arg Gln Gly Val Ile Ile Arg Xaa Gly Val Gly Tyr Pro Thr His  
 325 330 335

Leu Arg Val Thr Ile Gly Thr Leu Glu Gln Asn Gln Arg Phe Leu Glu  
 340 345 350

Ala Leu Asp Lys Ala Leu Glu Leu Arg Gly Val  
 355 360

<210> 37  
 <211> 52  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Primer for PCR

<400> 37  
 ccgagaattc attaaagagg agaaattaac tatgagaaaa ggacttgcaa gt

52

<210> 38  
 <211> 31  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> Primer for PCR

<400> 38

a!  
 Cont



tttcgggaac ttctctagat tcctaggagg c

31

<210> 39  
 <211> 1185  
 <212> DNA  
 <213> Aquifex

<400> 39  
 atgagaaaag gacttgcaag tagggtaagt cacctaaaac cttccccccac gctgaccata 60  
 accgcaaaag caaaagaatt aagggtctaaa ggagtggacg ttatagggtt tggagcggga 120  
 gaacctgact tcgacacacc cgacttcata aaggaagcct gtataagggc ttttaaggga 180  
 ggaaagacca agtacgctcc ctccgcggga ataccagagc tcagagaagc tatagctgaa 240  
 aaactactga aagaaaacaa agttgagtac aaaccttcag agatagtcgt ttccgcagga 300  
 gcgaaaatgg ttctcttctt catattcatg gctatactgg acgaaggaga cgagggttta 360  
 ctacctagcc cttactgggt aacttacctt gaacagataa ggttcttcgg aggggttccc 420  
 gttgaggttc ctctaaagaa agagaaagga tttcaattaa gtctggaaga tgtgaaagaa 480  
 aagggttacgg agagaacaaa agctatagtc ataaactctc cgaacaaccc cactggtgct 540  
 gtttacgaag aggaggaact taagaaaata gcggagtttt gcgtggagag gggcattttc 600  
 ataatttccg atgagtgcta tgagtacttc gtttacggtg atgcaaaatt tgtagccct 660  
 gcctctttct cggatgaagt aaagaacata accttcacgg taaacgcctt ttcgaagagc 720  
 tattccatga ctggttgccg aatagggttat gtagcgtgcc ccgaagagta cgcaaaagt 780  
 atagcgagtc ttaacagcca gagtgtttcc aacgtcacta cttttgccca gtatggagct 840  
 cttgaggcct tgaaaaatcc aaagtctaaa gattttgtaa acgaaatgag aaatgctttt 900  
 gaaaggagaa gggatacggc tgtagaagag ctttctaaaa ttccaggtat ggatgtggta 960  
 aaaccgaag gtgcctttta catatttccg gacttctccg cttacgctga gaaactgggt 1020  
 ggtgatgtga aactctcgga gttccttctg gaaaaggcta aggttgccgt ggttcccgt 1080  
 tcggccttcg gagctcccgg atttttgagg ctttcttacg ccctttccga ggaaagactc 1140  
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 <213> Aquifex

<400> 40

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Thr Leu Thr Ile Thr Ala Lys Ala Lys Glu Leu Arg Ala Lys Gly Val

a  
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20	25	30
Asp Val Ile Gly Phe Gly Ala Gly Glu Pro Asp Phe Asp Thr Pro Asp 35 40 45		
Phe Ile Lys Glu Ala Cys Ile Arg Ala Leu Arg Glu Gly Lys Thr Lys 50 55 60		
Tyr Ala Pro Ser Ala Gly Ile Pro Glu Leu Arg Glu Ala Ile Ala Glu 65 70 75 80		
Lys Leu Leu Lys Glu Asn Lys Val Glu Tyr Lys Pro Ser Glu Ile Val 85 90 95		
Val Ser Ala Gly Ala Lys Met Val Leu Phe Leu Ile Phe Met Ala Ile 100 105 110		
Leu Asp Glu Gly Asp Glu Val Leu Leu Pro Ser Pro Tyr Trp Val Thr 115 120 125		
Tyr Pro Glu Gln Ile Arg Phe Phe Gly Gly Val Pro Val Glu Val Pro 130 135 140		
Leu Lys Lys Glu Lys Gly Phe Gln Leu Ser Leu Glu Asp Val Lys Glu 145 150 155 160		
Lys Val Thr Glu Arg Thr Lys Ala Ile Val Ile Asn Ser Pro Asn Asn 165 170 175		
Pro Thr Gly Ala Val Tyr Glu Glu Glu Glu Leu Lys Lys Ile Ala Glu 180 185 190		
Phe Cys Val Glu Arg Gly Ile Phe Ile Ile Ser Asp Glu Cys Tyr Glu 195 200 205		
Tyr Phe Val Tyr Gly Asp Ala Lys Phe Val Ser Pro Ala Ser Phe Ser 210 215 220		
Asp Glu Val Lys Asn Ile Thr Phe Thr Val Asn Ala Phe Ser Lys Ser 225 230 235 240		
Tyr Ser Met Thr Gly Trp Arg Ile Gly Tyr Val Ala Cys Pro Glu Glu 245 250 255		
Tyr Ala Lys Val Ile Ala Ser Leu Asn Ser Gln Ser Val Ser Asn Val 260 265 270		
Thr Thr Phe Ala Gln Tyr Gly Ala Leu Glu Ala Leu Lys Asn Pro Lys 275 280 285		
Ser Lys Asp Phe Val Asn Glu Met Arg Asn Ala Phe Glu Arg Arg Arg 290 295 300		
Asp Thr Ala Val Glu Glu Leu Ser Lys Ile Pro Gly Met Asp Val Val 305 310 315 320		
Lys Pro Glu Gly Ala Phe Tyr Ile Phe Pro Asp Phe Ser Ala Tyr Ala 325 330 335		
Glu Lys Leu Gly Gly Asp Val Lys Leu Ser Glu Phe Leu Leu Glu Lys 340 345 350		

a'  
cont

Ala Lys Val Ala Val Val Pro Gly Ser Ala Phe Gly Ala Pro Gly Phe  
355 360 365

a<sup>1</sup> Leu Arg Leu Ser Tyr Ala Leu Ser Glu Glu Arg Leu Val Glu Gly Ile  
370 375 380

Arg Arg Ile Lys Lys Ala Leu Glu Glu Ile  
385 390

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